

INTERSPiRO

SPIROMATIC 90 U

User manual



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Important information to user

Please read this information carefully before referring to the apparatus instructions.

The Spiromatic 90 U breathing apparatus should only be used by adults in good physical and physiological condition.

The face mask may not seal properly with your face if you have a beard, heavy sideburns or other physical characteristics interfering with the mask's contour.

An improper facial seal may allow non-respirable air to leak into the mask, reducing or eliminating respiratory protection. The seal must be tested before each use.

Do not use Spiromatic in an emergency/rescue situation unless you have received proper training in its use, have read and understood this User manual and demonstrated proficiency to a responsible teacher or supervisor. Special attention must be given to:

- face seal
- test before use
- awareness if different durations at different conditions
- emergency situation (loss of air and free air flow)
- procedure at low-air alarm.

Only holders of a valid INTERSPIRO Service Certificate may service and test Spiromatic apparatus.

Failure to comply with this special points can result in respiratory injury or death for the user and may have serious consequences for people to be rescued and/or items of value to be saved.

Technical description

The SPIROMATIC 90 U models are self contained breathing apparatus (SCBA) for work in contaminated hazardous environments.

The apparatus consists of the following main components:

- Basic model
- Face mask with breathing valve - the SPIROMATIC mask
- Air supply

The SPIROMATIC 90 U apparatus has been tested in accordance with EN 137 for types of use specified. EC Type-examination (Directive 89/686/EEC) by SGS Yarsley ICS Ltd., Weston-super-Mare, BS22 OWA, UK. (Notified Body No 0120).

The apparatus uses a single compressed air cylinder for the air storage. The cylinder is mounted onto an anatomically designed backplate.

The high pressure in the cylinder is reduced in two steps or stages, down to a breathable pressure. This is done to achieve lowest possible resistances and high capacity when breathing in the unit i.e. a very low breathing exertion even at very high workloads.

The first reduction of the high pressure is performed in the balanced piston type pressure regulator. The second reduction to breathable air is performed by the breathing valve located at the face mask. The breathing valve is a demand valve which means that the valve senses the demand for an inhalation of air and it opens to permit exactly the air flow demanded. The inlet valve closes when the inhalation stops and an exhalation valve opens upon exhalation. The breathing valve creates a small positive pressure inside the face mask during the whole breathing cycle to effectively prevent any inward leakage from the surrounding atmosphere. This function of positive pressure is automatically switched on by the first inhalation

The apparatus has an audible warning device placed at the pressure gauge which is located on the chest of the user. This allows both the gauge and warning device to be moved closer to the wearers head, to allow better sight of the gauge and better hearing of the warning signal. Both the warning device and the regulator unit are separate components and therefore easily assembled or dismantled from the unit in order to permit fast exchange service if required.

Note! Correct planning of any operation involving the use of a breathing apparatus is essential.

BASIC MODEL

The basic model consists of the following components:

- Harness assembly
- Regulator unit assembly
- Warning device assembly



Harness assembly

The harness assembly comprises an anatomically designed backplate of a self extinguishing material, webbing straps and a manifold assembly. The two shoulder straps with adjustable buckles are mounted onto the top of the backplate and to the two hinged sidearms at the bottom of the backplate. A waist strap with quick release buckles is mounted around the backplate and the two sidearms.



The upper part of the shoulder straps are padded with a soft self extinguishing material inside a Nomex protective cover to increase comfort and insulation against heat and flames. The straps have velcro loops to hold the hoses coming over the shoulders. The breathing hose is to be assembled to the right strap and the high pressure hose with gauge and warning device is to be mounted to the left strap. A cylinder strap with locking buckle is assembled to the backplate. The strap is easily adjusted for different cylinder diameters.

Manifold assembly

The manifold assembly comprises the regulator manifold with a handwheel connector for the cylinder valve, a particle filter, a high pressure hose with a whistle and manifold with a high pressure gauge.

The manifold is mounted onto the backplate in its manifold holder by a bolt which allows the manifold to move which helps to simplify cylinder connection.



Regulator unit

The regulator unit consists of a pressure reducer and a breathing hose for connection to the SPIROMATIC mask.

Some models have a breathing hose with an extra-air manifold with a quick coupling for use with airline system, ventilated chemical suit, rescue mask or rescue hose.

The regulator unit is of a "plug in" type which means that it is pushed into the



manifold and locked in place with a locking spring and cover.

This modular system enables simple servicing to be carried out with minimum down time for the apparatus by using service exchange.

Note! Before disconnecting a the regulator unit it is important that the system is depressurized.

The pressure regulator used in the Spiromatic 90U-models is a balanced piston pressure reducer with an extremely high flow capacity. The very high capacity ensures that the positive pressure is maintained in the mask even at low cylinder pressures and at extremely high breathing rates. The pressure regulator is fitted with a safety valve which prevents the pressure to reach unsafe levels.

Audible warning

The warning device like the pressure regulator is of a "plug in" type. It means that the same simple servicing system as for the regulator can be used. The unit has a pressure reducer built into the unit which reduces the cylinder pressure and allows a small constant flow. When the cylinder pressure reaches a pressure of 55 ± 5 bar (5.5 ± 0.5 MPa), the regulator opens and feeds the audible alarm. The alarm signal is approx. 95 dB and continues to sound until the cylinder contents are depleted.



Note! Before disconnecting the audible warning unit, it is important that the system is depressurized.

THE SPIROMATIC MASK

The SPIROMATIC Mask has been designed as a unit consisting of a mask and a breathing valve where the components are connected via a bayonet coupling and locked together with a cover or a speech diaphragm.

Face mask

The Spiromatic face mask has been tested in accordance with EN 136 for types of use specified and are approved for use with compressed air breathing apparatus.

The face mask with inner mask is made of rubber and provided with a large easily replaceable visor, that is held in place by two frame halves and two screws. The mask also has provisions for fitting spectacles. In the connection piece for the breathing valve there is space for the SAVOX radio microphone and loud speaker system.



The rubber head harness has five straps that are tightened and locked by buckles. The wide sealing edge of the mask is pressed slightly against the face by the positive pressure and follows the contours of the face giving an effective seal.

Rebreathing of carbon dioxide enriched exhaled air must be eliminated as far as possible (a small dead space). The dead space has been minimized by the inner mask and separate inhalation and exhalation channels which coincide with channels in the breathing valve. In that way, inhalation and exhalation air will never be mixed.

During inhalation, air flows from the breathing valve up through the demister ports over the inside of the visor preventing condensation from forming, and on through the non-return valves into the inner mask.

During exhalation, the air is expelled to the ambient atmosphere through the exhalation valve.

Breathing valve

The breathing valve is of the demand type i.e. air is only supplied during inhalation. The breathing valve ensures the same extremely low breathing resistance irrespective of variations in the medium pressure. The valve is designed to give a slight positive pressure in the mask. The positive pressure is turned on automatically when the user makes his first inhalation in the mask. This ensures that there is no way of forgetting to turn on the positive pressure or that it could become accidentally turned off. The breathing valve is fitted with a safety valve which prevents the pressure to reach unsafe levels.

Air supply

The compressed air supply for the SPIROMATIC 90 U is contained in cylinders which may vary in maximum filling pressure capacity, size and construction. National Standards and/or Regulations will dictate which cylinders may be fitted. The compressed air cylinders are fitted with a cylinder valve which has a facility to be locked in the open position to prevent accidental closure.

Note! To close the cylinder valve, the handwheel must first be pushed in and then turned in a clockwise direction.

Note! The air supply shall meet the requirements for breathable air according to EN 132.

DURATION TIME

The air consumption of any self-contained breathing apparatus varies depending on the nature of the work, the user's physical condition, and experience of using a breathing apparatus.

An internationally accepted method of calculating the theoretical duration of an apparatus is to assume an average consumption of 40 l/min.

Example:

A 6 litre cylinder charged to 200 bar contains approximately

$200 \times 6 = 1200$ litres of free air at atmospheric pressure.

With an air consumption of 40 l/min the duration would be 30 minutes.

Note! The warning period is also included in the above calculation. The warning period is approximately 6-10 minutes

Preparation for use

1. Place the harness assembly with the pressure regulator and the warning device on the floor. Open the cylinder strap by opening the velcro end and releasing the toggle.



2. Place a fully charged cylinder into the cylinder strap and position the cylinder valve onto the connection. The manifold connector is designed to be flexible in order to facilitate positioning. Ensure before connection that the sealing o-ring is in good condition and is correctly fitted.



3. Tighten the handwheel connector by hand.

4. Tighten the strap and press down the toggle to tighten the connection. Finally close the velcro end.



CONNECTING THE SPIROMATIC MASK

1. Connect the breathing valve to the mask by turning it counter clockwise.
2. Mount the cover (or speech diaphragm) in the mask and tighten the screws by hand.
3. Connect the mask to the pressure regulator and tighten the union nut by hand.



APPARATUS PRE-USE CHECK

1. Check that the positive pressure is turned off by pressing the black lever on the valve towards the housing.



2. Open the cylinder valve.
3. Read off the pressure gauge. Pressure should be no less than 10 % below the filling pressure i.e. 200 bar apparatus: 180 bar, 300 bar apparatus: 270 bar.



Note! As the apparatus has a restrictor fitted to protect the high pressure hose and gauge, it takes some time before the pressure gauge shows the full pressure. Hence it is necessary to wait about a minute in order to fully pressurize the system.

4. Close the valve and check for leakages during 1 minute by checking that the pressure gauge reading does not fall by more than 10 bar.
5. Switch on the positive pressure by slowly moving the black lever out a little from the valve housing until a small air flow is heard.
6. Read off the gauge when the audible alarm sounds. The pressure should be minimum 50 bars (European standard: EN 137).
7. Depressurize the system by turning on the positive pressure fully.
8. Turn off the positive pressure.

Donning the apparatus

1. Before donning, check that the shoulder straps are pulled back and that the waist strap male buckle is adjusted outwards.

2. Don the apparatus. The cylinder valve shall be downwards.

3. Grip the free ends on the shoulder straps and pull down until the back plate fits comfortably. During this manoeuvre, it is preferable to relieve the weight of the apparatus by a little jump or resting the apparatus on something.



4. Press the waist strap female and male buckle halves together.

Adjust and tighten the waist strap by pulling on the free end.

The waist strap goes around and can easily be adjusted so that the buckles come in front of the body.



5. Check that the positive pressure lever is switched off.

6. Open the cylinder valve completely. Read off the gauge.

7. When the cylinder is opened, the audible warning will sound until the pressure reaches a level over the pre-determined setting of the whistle. This gives a check that the whistle is functioning.



8. Put on the face mask by first pulling the chin into the chin support and then pushing the head harness over the forehead and backwards.

9. Tighten the head harness by first tightening the lower buckles. The last buckle to tighten is the forehead buckle.



10. Inhale by taking a short fast breath to automatically switch on the positive pressure. Exhale and hold your breath. Listen for any leakage. If there is a fitting leakage first check that no hair is caught under the sealing edge of the face mask. Adjust if necessary.

11. Check the positive pressure by holding your breath and insert two fingers under the mask sealing edge. Hold breath and an outward flow shall be heard.

12. Read off the pressure gauge once again before use.

During use

Check the pressure gauge from time to time whilst using the apparatus.

When 55 ± 5 bar remains in the cylinder, the audible alarm will start to sound. The signal will continue during the whole withdrawal until almost all the air has been used up.

Note! The user must heed the warning and start retreating immediately.

Note! Correct planning of any operation involving the use of breathing apparatus is essential.

After use

1. Remove the face mask by loosening the lowest head harness straps first. Switch off the positive pressure by pressing in the black lever and remove the mask at the same time.



2. Undo the waist belt buckle by pressing the male buckle.



3. Pull the shoulder strap buckles upwards and the straps will automatically loosen. Take off the apparatus by sliding it under the right arm and forward. Close the cylinder valve by pressing the handwheel towards the valve and turning it clockwise until closed.



Connection of extra hoses

The SPIROMATIC 90 U can be equipped with an extra-air manifold fitted with a quick connection for extra air.

The connection can be used to:

- Feed the apparatus with medium pressure air from an external air source.
- Connecting a chemical suit ventilation system.
- Connecting rescue hoses between two apparatus.
- Connecting the rescue mask REVITOX.

To take out air from the apparatus to feed a ventilated chemical suit/rescue hose or Revitox extra mask, a special female coupling with a non-return valve opener is used. This device opens the non-return valve in the male coupling mechanically. This female coupling must not be used in airline systems as the non-return valve must be able to close if the airline hose is cut off by any means. The female couplings with a non-return valve opener shall only be used on shorter hoses that can be controlled and the couplings disconnected if necessary.

CONNECTION

The securing ring on the female coupling must be open before connection. Press the female onto the male and secure the fitting by screwing up the locking ring.

DISCONNECTION

Unscrew the locking ring and pull back the movable sleeve on the coupling.

Cleaning of the basic unit and cylinder unit

- 1.** Check that the positive pressure is turned off.
- 2.** Open the cylinder valve before cleaning the apparatus. The air pressure will prevent water from entering the breathing system.
- 3.** Put the apparatus except the SPIROMATIC mask and the pressure gauge manifold with the warning device into water with a mild detergent.
- 4.** Look for bubbles indicating leaks. Any leakage should be repaired by INTERSPIRO or an authorized Service Agent.
- 5.** Wash the apparatus, the gauge and the warning device thoroughly, using a brush if necessary to remove heavy dirt.
- 6.** After cleaning rinse in clean water.
- 7.** Close the cylinder valve. If the apparatus is equipped with an extra-air coupling depressurize by opening the non-return valve with a pen or something similar in order to remove any water. If there is no extra- air coupling, turn on the positive pressure to vent the system.
- 8.** Check that no water has entered the regulator spring chamber through the equalization hose by opening the pressure regulator rubber protection.
- 9.** Let the apparatus dry.
- 10.** Change to a fully charged cylinder.

Cleaning of the Spiromatic mask and breathing valve

To clean the face mask and breathing valve after normal use, the following simplified cleaning procedure may be used.

Note! If the SCBA after cleaning is to be stored in a temperature below 0°C, the cleaning must follow the instructions given for the more thorough procedure.

CLEANING PROCEDURE

1. Depressurize the system by closing the cylinder valve and activating the positive pressure. (The black lever turned away from the housing).
2. Unscrew the medium pressure hose connection.
3. Remove the blank cover, speech diaphragm or the SAVOX radio unit by unscrewing the two screws.

Note! The Savox radio unit has one screw which can be reached from the inside of the mask.

4. Turn the breathing valve anticlockwise so it comes away from the bayonet fitting and pull the valve outwards.

5. Seal off the connection nipple with a rubber plug. Seal off the inlet channel with your thumb or seal it off with a rubber plug.



6. Wash the face mask and breathing valve with a soft brush and soap solution (or approved cleaning detergent) in luke warm water approx. 40 °C.

7. Rinse in clean water. Shake out as much water as possible from the positive pressure unit.



8. Remove the rubber plugs and check that no water has entered the inlet side of the breathing valve.

9. Leave parts to dry. Grease the o-ring with a thin layer of approved lubricant. Assemble the breathing valve to the face mask and fit the blank cover, speech diaphragm or SAVOX radio unit to lock the bayonet fitting.

Note! If water has entered the breathing valve it is simple to dry the valve by assembling the valve to the medium pressure hose.

Check that the positive pressure is turned off.

Open the cylinder valve and activate the positive pressure and allow the free water to be blown out of the inlet chamber.

Storage

Apparatus should be stored in a cool, dust-free and dry place.

Rubber parts must be protected against direct sunlight, ozone, UV radiation, grease and oil.

The demand valve should be stored with the black lever turned away from the valve housing. Positive pressure turned off.

Warning! If the apparatus is to be stored at temperatures below zero it is essential that the apparatus is dried thoroughly before storage.

Annual service

The SPIROMATIC 90 U breathing apparatus must every year undergo a complete function test in order to verify that the set fulfils the requirements and is safe to use.

Annual service and/or repairs shall only be performed by personnel certified by INTERSPIRO.

Service and Testing schedule

		Before use		After use		Every year		Every second year		After 5-6 years	
NO	Apparatus/ component	Service	Testing	Service	Testing	Service	Testing	Service	Testing	Service	Testing
1	Harness, Manifold			GV							
2	Pressure reducer, Manifold				S		F			F	
2.1	Service parts									R	
2.2	HP O-rings to cylinders					V			R	R	
2.3	Filter								R	R	
2.4	Pressure gauge						F				
3	Whistle/ Warning device	S		S						F	
3.1	Service parts									R	
4	Hoses										
4.1	High pressure hoses			V		V					
4.2	Medium pressure hoses			V		V					
5	Breathing valve	S	CD	F		F					
5.1	Diaphragm			V		V ^a					
5.2	Exhalation valve			V		V ^a					
5.3	Service parts									R	
6	Full face mask	S	CD	F		F					
6.1	Exhalation valve					V					
6.2	Speech diaphragm					V					
6.3	Service parts									R	
7	Cylinder valve			V	F					F	
7.1	Service parts									R	
8	Cylinder			V		Periodical test to accordance with local requirements					
9	Breathing apparatus, complete	S	C ^{***}	F		F					G
9.1	Service parts									R	
V = visual inspection C = cleaning CD = cleaning and disinfection S = short test by user F = function test by service people G = full inspection R = renew				This schedule shows the minimum requirements. They can differ between local requirements.							
* under normal conditions the life time is several years. But different circumstances like dirt or something in the cylinder valve can cause leakages, so Interspiro recommends a annual renewal.											
** If stored *** If necessary											

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